

THREE NEW FROGS (*ELEUTHERODACTYLUS*: LEPTODACTYLIDAE) FROM CLOUD FORESTS IN EASTERN DEPARTAMENTO CALDAS, COLOMBIA

por

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Resumen

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Se nombran tres especies nuevas del género *Eleutherodactylus* de la ceja andina de la vertiente oriental de la cordillera Central en el Departamento de Caldas. Estas especies son un parte de una fauna grande de aquellos bosques. De un transecto entre 600 y 2600 m.s.n.m., se encuentran 32 especies de *Eleutherodactylus*, la mayoría de la cual se encuentran en bosques entre 1700 y 2250 m.s.n.m.

Palabras claves: Amphibia, biodiversidad, bosques nublados, Colombia, *Eleutherodactylus*, especies nuevas.

Abstract

Three new species of the genus *Eleutherodactylus* are named from cloud forests on the eastern slopes of the Cordillera Central in Departamento Caldas, Colombia. These three species are a part of a large fauna of frogs from those forests. In a transect between 600 and 2600 m, 32 species of *Eleutherodactylus* were found, the majority of which were found in forests between 1700 and 2250 m.

Key words: Amphibia, Biodiversity, Cloud forests, Colombia, *Eleutherodactylus*, New species.

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Introduction

In July 1992, JVR made initial collections in what would come to be known in the herpetological community as the bosques andinos de Florencia (Caldas). He revisited the region four more times (1992–1994), collecting primarily at higher elevations (1500–2650 m). Collecting at about 1750–1950 m at a site known as El Estadero, Rueda obtained eight species of *Eleutherodactylus* for which names are available [*E. babax* Lynch, *E. cabrerai* Cochran & Goin, *E. dorsopictus* Rivero & Serna, *E. erythropleura* (Boulenger), *E. mantipus* (Boulenger), *E. ruizi* Lynch, *E. thectopternus* Lynch, and *E. w-nigrum* (Boettger)] and many more species that lack names. During the same period, other biologists from the Instituto de Ciencias Naturales (Olga Castaño, Mariela Osorno, Pedro Ruiz, and Claudia Vélez) made collections at lower elevations in the watershed of the río La Miel (ca 600–1500 m).

Our initial study of the material reveals that 32 species of *Eleutherodactylus* were collected along the transect from Norcasia (ca 600 m) to ridges between Arboleda and Pensilvania (2450 m). Only four species of *Eleutherodactylus* were found at the lowland sites [*E. gaigei* (Dunn), *E. raniformis* (Boulenger), a species of the *diasistema* group, and a species of the *E. taeniatus* complex]. The remaining 28 species are primarily from the very mesic forested ridges (1750–2450 m) in the triangle formed by Arboleda, Florencia, and Pensilvania (Fig. 1). Such diversity at high altitudes is without parallel and substantially exceeds that reported by Lynch (1996a) and Ruiz et al. (1996) for sites on the Cordillera Occidental. This level of diversity also exceeds the richest lowland sites known in Amazonia (Lynch, 1980a) and in the chocoan lowlands (Lynch, 1979, 1980b). In addition to the ten named species mentioned above, *E. maculosus* Lynch, *E. permixtus* Lynch, Ruiz & Ardila, and *E.*

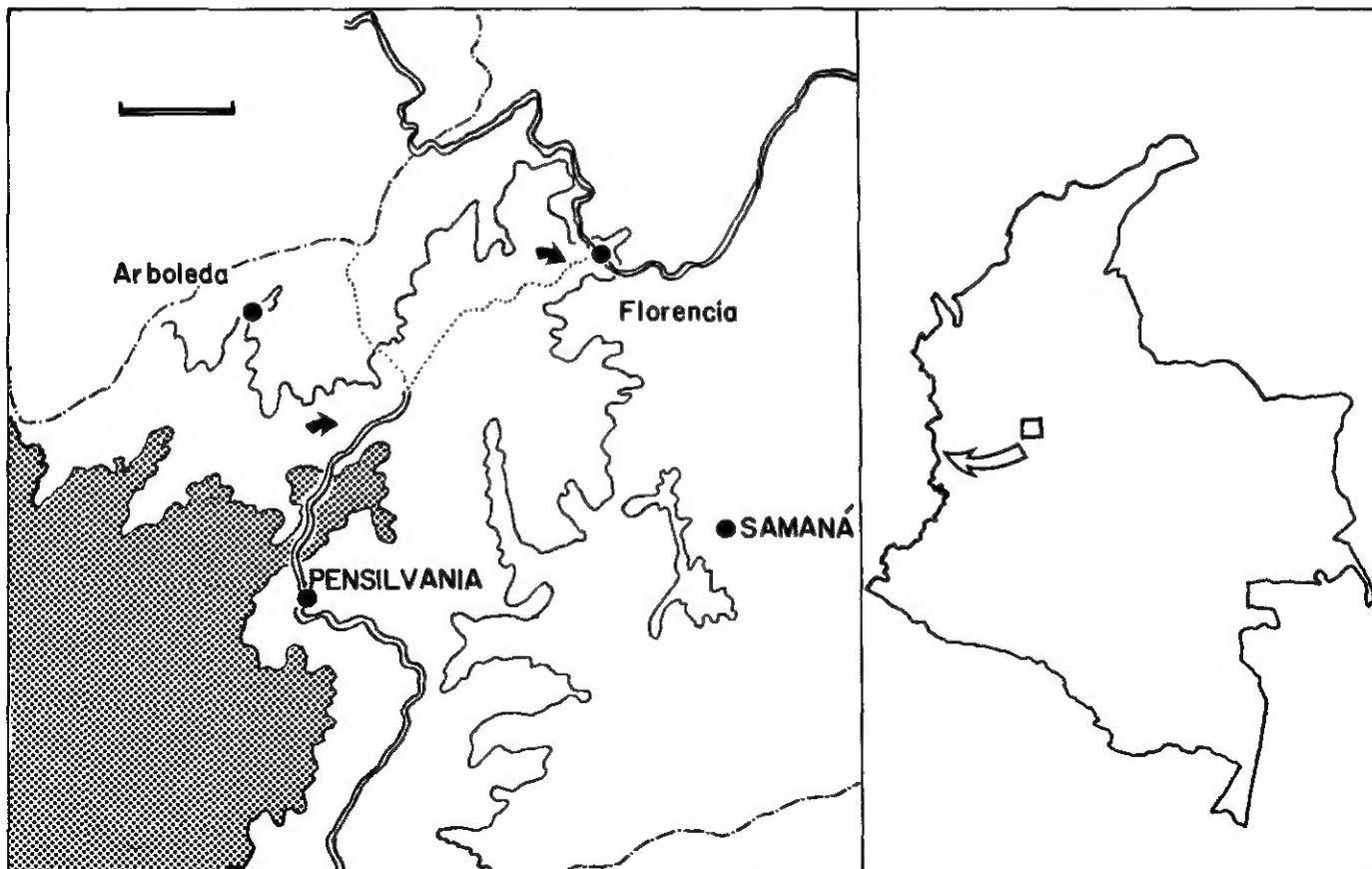


Figure 1. Map of eastern Departamento Caldas showing approximate locations of collection sites (solid arrows). Stippled area is above 2500 m. The other contour line is at 1500 m. Roads are double lines, trails are dashed.

uranobates Lynch were found at sites between 2000 and 2650 m. The remaining 19 species appear to be undescribed.

Materials and Methods

Specimens were measured to the nearest 0.1 mm using dial calipers under magnification. In the following accounts, the following abbreviations are used: ICNMHN (amphibian collection, Instituto de Ciencias, Museo de Historia Natural), E-N (eye to nostril distance), HW (head width), and IOD (interorbital distance). Means are reported as + one standard error of the mean.

Eleutherodactylus lichenoides sp. nov.

Fig. 2

Holotipo. ICNMHN 37205, one of a series collected 3 November 1994 by César Barbosa and J. Vicente Rueda (original field number VR 4833).

Type-locality. COLOMBIA, Departamento de Caldas, Municipio de Pensilvania, Km 24 de la via Pensilvania - Arboleda, sitio «Puerto Suarez», por la trocha que con-

duce a Florencia, Caldas, 2150 m.s.n.m. Approximately 5° 25' N, 75° 10' W.

Paratypes. ICNMHN 37171-85, topotypes taken with holotype; ICNMHN 37186-87, collected from type-locality 6 Nov., 1994, between 2000 and 2150 m; ICNMHN 37189-99, collected from a stream below the finca of señor Segundo Zuluaga, near type-locality, 8 Nov., 1994; ICNMHN 37200-04, collected along a transect of three streams in vicinity of type-locality, 2450-2600 m.s.n.m., 9 Nov. 1994; ICNMHN 36546-47, collected along trail beginning at Km 18 (Pensilvania-Arboleda road) toward Arboleda, ca 2000-2450 m.s.n.m., Nov. 1994.

Etymology. Greek (*leichen* + *oides*) meaning resembling lichens. The name is used in two meanings. Firstly, the dorsal coloration reminds us of some muted lichens we have seen on rocks and/or tree trunks, and, secondly, these frogs are usually found plastered to rock surfaces and appear to be lichens growing upon the rock faces.

Diagnosis. (1) skin of dorsum bearing low granules, no dorsolateral folds, that of venter coarsely areolate; (2)

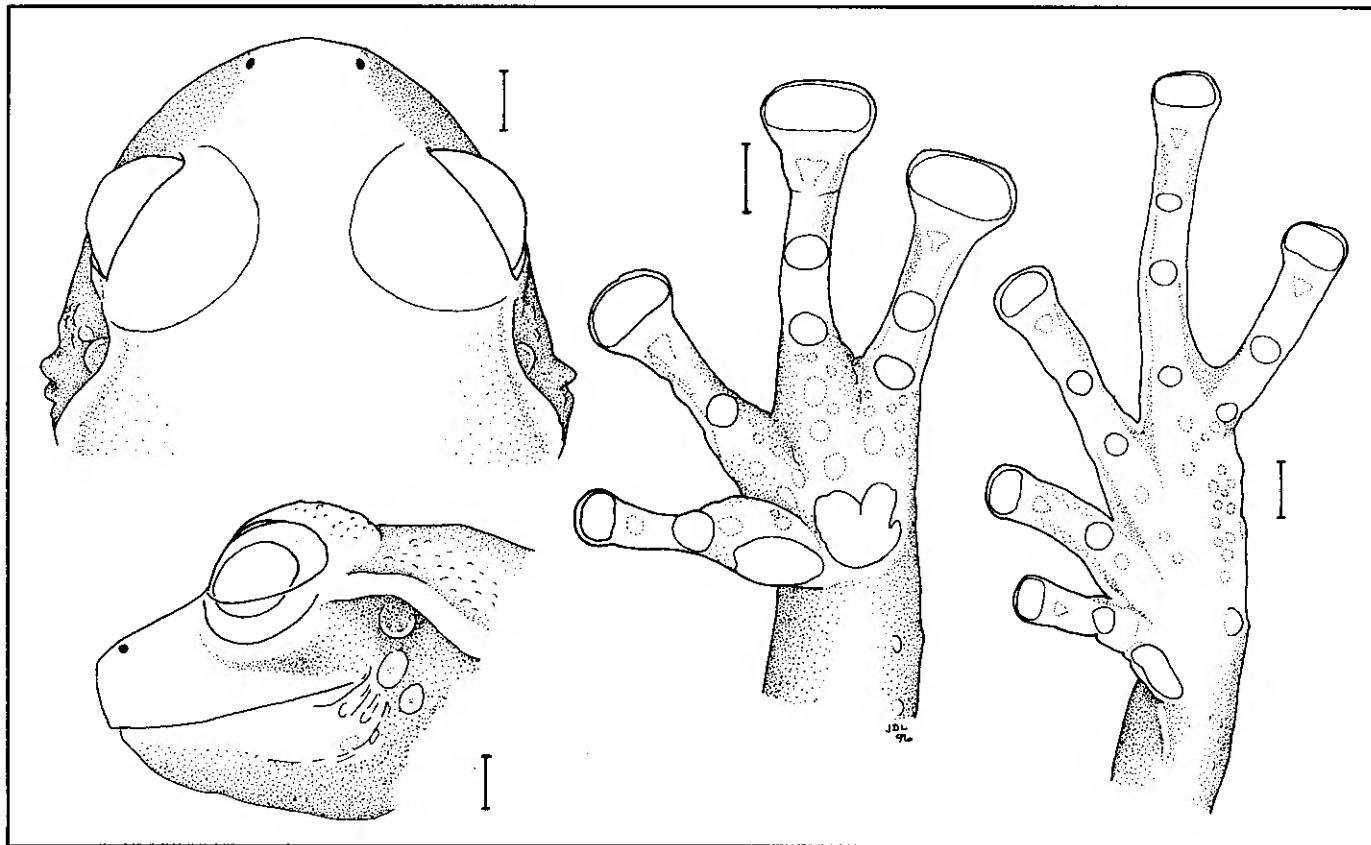


Figure 2. *Eleutherodactylus lichenoides* sp. nov. Head and hand (ICNMHN 37201); foot (ICNMHN 37202). Scales equal 2 mm.

tympanum small, 1/5 to 1/4 length of eye, partially concealed; (3) snout short, round in dorsal view, subtruncate in lateral profile; canthus rostralis rounded; (4) upper eyelid width greater than IOD; no cranial crests; (5) vomerine odontophores oval in outline; (6) males lacking nuptial pads and vocal slits; (7) first finger shorter than second, large round discs on outer fingers; (8) fingers bearing fleshy lateral fringes; (9) series of small ulnar tubercles; (10) small tubercles on heel and outer edge of tarsus; short inner tarsal fold present; (11) two metatarsal tubercles, inner oval, about 5 X size of outer; numerous supernumerary plantar tubercles; (12) toes bearing fleshy lateral fringes, basal webbing; fifth toe much longer than third; (13) dorsum brown with darker mottling (little indication of pattern), venter cream with brown mottling/reticulation; posterior surfaces of thighs brown with occasional cream flecks; (14) adults moderate-sized, males 26.0-31.6 ($\bar{x} = 29.7 + 0.3$) mm SVL, females 33.5-41.8 ($\bar{x} = 39.3 + 0.5$) mm SVL.

Eleutherodactylus lichenoides is a species of the *diaphonus* group (Lynch and Ruiz, 1996) most similar to *E. albericoi* but differing in being much larger, having more widely separated vomerine odontophores (not juxtaposed), and having small outer tarsal tubercles, and in lacking tubercles on the upper eyelids and nuptial pads and vocal slits in males.

Description. Head as wide as body, wider than long; HW 38.8-41.8 ($x = 40.2 + 0.2$)% SVL in males, 38.0-41.4 ($\bar{x} = 40.0 + 0.3$)% in females; snout round in dorsal view, subtruncate in lateral profile (Fig. 2); E-N 74.3-87.5 ($\bar{x} = 80.2 + 1.0$)% eye length in males, 88.0-97.7 ($\bar{x} = 91.7 + 0.8$)% in females; nostrils protuberant, directed dorsolaterally; canthus rostralis rounded; loreal region concave, sloping gradually to swollen upper lips; upper eyelid bearing minute tubercles; no cranial crests; upper eyelid width 100.0-145.4 ($\bar{x} = 117.4 + 3.3$)% IOD in males, 92.5-140.6 ($\bar{x} = 107.8 + 3.6$)% in females; supratympanic fold thick, ending above insertion of arm; tympanum round, upper edge hidden by supratympanic fold, separated from eye by distance ca 1.5 times tympanum diameter, in a depression on side of head (not superficial); tympanum 18.2-22.7 ($\bar{x} = 20.3 + 0.4$)% eye length in males, 19.2-26.7 ($\bar{x} = 23.1 + 0.8$)% in females; two large subconical postrostral tubercles; choanae round, not concealed by palatal shelf of maxillary arch when roof of mouth is viewed from directly above; vomerine odontophores median and posterior to choanae, oval, separated medially by nearly width of an odontophore, bearing transverse rows of 4-5 teeth in males, 4-7 teeth in females; tongue oval in outline, longer than wide, poste-

rior border notched, posterior 1/4 not adherent to floor of mouth; no vocal slits in adult males.

Skin of dorsum bearing low granules, especially evident on lower back and flanks (skin of head nearly smooth); flanks and ventral surfaces bearing coarse granules; discoidal folds prominent, well anteriad to groin; anal opening just below top level of thighs; series of low ulnar warts along outer edge of forearm; palmar tubercle bifid, ca twice size of oval thenar tubercle; numerous supernumerary palmar tubercles, largest at bases of fingers; subarticular tubercles broader than long (distal tubercle of Finger IV almost bifid); thick lateral keels on fingers; discs round, about twice width of digit below disc on outer fingers; disc of thumb only slightly expanded; first finger shorter than second; base of thumb swollen in males, no nuptial pad.

Nonconical tubercle on heel and minute outer tarsal tubercles; thickened fold on inner edge of tarsus just proximal to and touching inner metatarsal tubercle; inner metatarsal tubercle about 2.5 times as long as wide, about five times size of low outer metatarsal tubercle; numerous low supernumerary plantar tubercles, including more prominent ones at bases of toes; fleshy lateral fringes on toes, coalescing as basal webbing (Fig. 2); toe discs round, slightly smaller than discs of outer fingers; third toe reaches 2/5 - 1/2 way between penultimate and distal subarticular tubercles of toe IV; toe V reaches to distal border of distal subarticular tubercle of toe IV; heels touching when flexed hindlimbs are held perpendicular to sagittal plane; shank 48.7-55.8 ($\bar{x} = 52.2 + 0.4$)% SVL in males, 49.6-55.7 ($\bar{x} = 52.1 + 0.6$)% in females.

Dorsum brown with darker mottling; ochre blotch on midline above arms (occasionally, another ochre blotch is above the vertebrae, appearing as a loose stripe); area in front of the place where an interorbital bar is expected is paler than rest of dorsum but same color; prominent dark brown carthal-supratympanic stripe and labial bars; limb bars diffuse, generally narrower than interspaces; venter dirty cream with brown mottling or reticulum; concealed surfaces of limbs and groin gray-brown with occasional cream flecks.

In life, *E. lichenoides* is dark green to pale olive above with even darker (dark green to almost black) mottling with rust or beige scapular (and vertebral) blotches; markings on the side of the head are black; lips are burnt yellow with black labial bars; flanks are creamy-yellow with sepia reticulation; groin and concealed surfaces of the limbs are brown; throat is yellowish and the abdomen is pale yellow to pale brown with sepia to gray reticulation;

the iris is dark coppery brown; digital disks are whitish. [Color notes from field notes of Jose V. Rueda, 3-8 November 1994].

Measurements of holotype in millimeters. SVL 40.4, tibia 20.2, HW 15.6, head length 12.9, chord of head length 14.5, upper eyelid width 4.0, IOD 3.5, tympanum length 1.1, eye length 5.1, E-N 4.7.

Natural history. Most of the specimens, and all of the adults, were found on wet slate and other rocks along well-shaded streams. Smaller individuals were found on vegetation along the side of the streams. The field notes report that the frogs occupy the same microhabitat as *Centrolene geckoideum*. The largest juvenile female (ICNMHN VR5005) is 34.3 mm SVL and the only young female (ICNMHN VR4837) is 37.6 mm SVL. One male (ICNMHN VR4921) might be immature (27.5 mm SVL) because his testes are small and not swollen.

Remarks. The discovery of *E. lichenoides* on the eastern slopes of the Cordillera Central is surprising because the other three species are known only from the western flanks of the Cordillera Occidental (Choco - Cauca) (Fig. 3). Lynch and Ruiz-C (1996) suspected that

the distribution of those species reflected a microhabitat association rather than simply altitude and the discovery of *E. lichenoides* appears to corroborate that view. All four species are frogs found on wet rock faces in well-forested regions. *Eleutherodactylus lichenoides* occurs at higher elevations than do the other three species (980 - 1560 m).

Eleutherodactylus tribulosus sp. nov. Figs. 4-6

Holotype. ICNMHN 37169, an adult female collected 6 November 1993 by J. Vicente Rueda (original field number VR 4083).

Type-locality. COLOMBIA, Municipio Samana, corregimiento de Florencia, sitio «El Estadero», ca 6 km SW Florencia, 1950 m.s.n.m. Approximately 5°31' N, 75°04' W.

Paratype. ICNMHN 36559, an adult female collected along a trail beginning at Km 18 (carr. Pensilvania - Arboleda) and moving toward Arboleda, 2000 - 2450 m.s.n.m.

Referred specimen. ICNMHN 37170, Municipio Pensilvania, Km. 24 via Pensilvania a Arboleda, 2000 - 2150 m.s.n.m.

Etymology. Latin, meaning thorny, in reference to the abundance of tubercles covering the upper surfaces of the frog.

Diagnosis. (1) skin of dorsum finely shagreen with heavy paravertebral folds and numerous conical tubercles, that of venter areolate; (2) tympanum 2/5-1/2 eye length; (3) snout long, acuminate in dorsal view, protruding in lateral profile; canthus rostralis sharp; (4) upper eyelid about as wide as IOD, bearing one large and several small conical tubercles; low cranial crests present, ending in bony knobs; (5) vomerine odontophores oval, not greatly elevated; (7) first finger shorter than second, bearing relatively narrow round discs; (8) fingers bearing narrow lateral keels; (9) row of large ulnar tubercles, including one on elbow; (10) heel bearing large calcar; conical tubercles on underside of tarsus; tubercles along inner and outer margins of tarsus; (11) two metatarsal tubercles, inner oval, 4X size of outer; numerous supernumerary plantar tubercles; (12) toes long, lacking lateral keels and webbing; fifth toe longer than third but not reaching distal subarticular tubercle of Toe IV; (13) dorsum cream, reticulated with gray, bearing black flecks outlining dorsal markings, venter cream with faint brown reticulum; pigmentless areas in groin and on concealed surfaces of limbs; (14) two adult females 26.5 mm SVL.

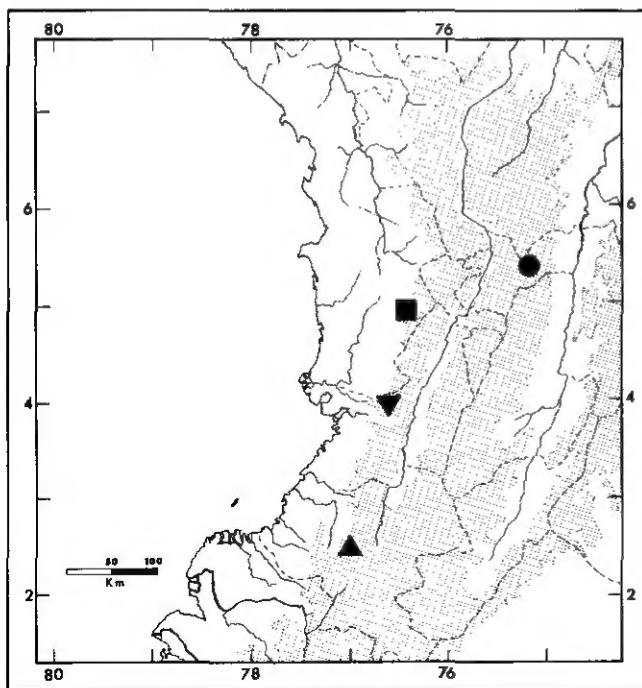


Figure 3. Map of western Colombia (stippled areas above 1000 m) showing distributions of *Eleutherodactylus albericoi* (square), *E. diaphonus* (inverted triangle), *E. diogenes* (triangle), and *E. lichenoides* sp. nov. (circle).

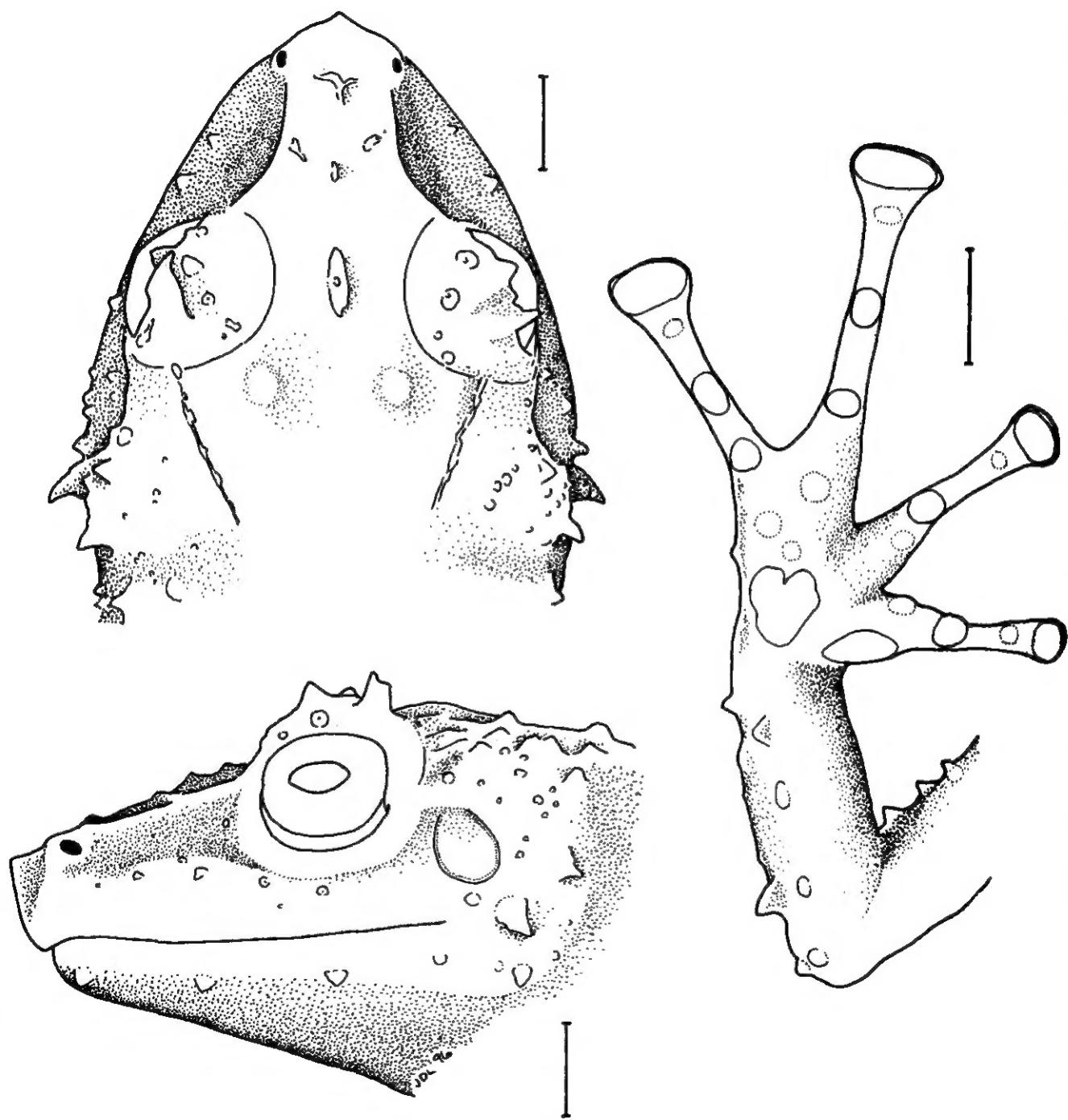


Figure 4. *Eleutherodactylus tribulosus* sp. nov. (ICNMHN 37169). Scales equal 2 mm.

Eleutherodactylus tribulosus is most similar to its sister-species, *E. galidi*, but differs in being smaller, having bony projections on the top of the skull not incorporated into the cranial crests, having cranial crests that project laterally (rather than dorsally), and in lacking scattered large tubercles on the venter.

Description. Head slightly narrower than body, longer than wide; HW 38.1-41.1% SVL; snout acuminate in dorsal view with papilla at tip, protruding in lateral profile; snout long, E-N 119.4-129.0% eye length; nostrils protuberant, directed laterally; canthus rostralis sharp, straight anteriorly, concave posteriorly; loreal region strongly concave with abrupt slope near canthus rostralis; lips flared; upper eyelid bearing large conical tubercle on posterior third (Fig. 4) and 3-4 smaller conical tubercles over rest of surface; upper eyelid width 80.0-108.3% IOD; low cranial crests present, directed dorsolaterally over fat deposits medial to eyeballs, ending in pair of bony tubercles; supratympanic fold obsolete; tympanum higher than long, its length 38.7-48.4% eye length, separated from eye by distance equal its own length; temporal region swollen; postrietal tubercles conical, more posterior one elongate; choanae oval, longer than wide, not concealed by palatal shelf of maxillary arch; vomerine odontophores just posterior to posterior edges of choanae, oval in outline, about half the size of a choana, separated medially by distance equal 1/2 width of an odontophore, bearing 3-4 teeth in slightly arched row; tongue slightly longer than wide, posterior edge not adherent to floor of mouth, not notched.

Dorsum finely shagreen with prominent scapular folds ["><]; chevron-shaped sacral ridges present; conical tubercles along areas above ilia and onto flanks; flanks covered with many nonconical and conical warts; subconical tubercles on side of head, top of snout (including a large one between eyes), over temporal region, and along ventrolateral margin of mandibles; upper surfaces of limbs with mixture of conical and subconical tubercles; no anal sheath; throat and venter coarsely areolate; discoidal folds faint, well anteriad to groin; blade-like conical ulnar tubercles including smaller tubercle on elbow (Fig. 4); palmar tubercle bifid, much larger than oval thenar tubercle; numerous supernumerary palmar tubercles; subarticular tubercles round, nonconical; thin lateral keels on long slender fingers; fingers bearing round discs, smallest on thumb; first finger shorter than second.

One or two conical tubercles on knee; heel bearing long calcar; 2-3 nearly so large tubercles on underside of

tarsus (Fig. 5); 1-2 nonconical tubercles along inner edge of tarsus; small, subconical tubercles along outer edge of tarsus and onto postaxial surface of foot; inner metatarsal tubercle 2 1/2 times as long as wide; outer metatarsal tubercle subconical, 1/4 size of inner; numerous supernumerary plantar tubercles, largest at bases of toes; subarticular tubercles round to longer than wide, nonconical; toes lack lateral keels; toes long and slender with round discs (smaller than those of outer fingers); tip of toe III reaches to middle of penultimate subarticular tubercle of toe IV, tip of toe V reaches about 2/3 of the way between penultimate and distal subarticular tubercles of toe IV; heels overlapping when flexed hindlegs held perpendicular to sagittal plane; shank 57.0-60.8% SVL.

Dorsum cream reticulated with gray; scapular folds cream; dorsal markings indicated by black flecks (sacral chevron, scapular reverse parentheses, interorbital bar, inguinal spots); limb bars oblique on shank, narrower than interspaces; canthal-supratympanic stripe and two subocular bars brown with black flecks; vague blotches on upper flanks; cream raphe on throat, brown blotches along margins of lower jaw; venter faintly reticulated with brown; pigmentless area in groin and anterior surfaces of thighs, on posterior surfaces of thighs, and on underside of shank (latter bearing some brown reticulation).

In life, *E. tribulosus* is moss green above with a diffuse brown pattern; limbs banded reddish-brown; labial bars diffuse brown; flanks uniform green; groin and anterior surfaces of thighs yellowish-green; throat, breast, and anterior venter pale gray with fine cream flecks; posterior abdomen and undersides of limbs very pale yellow; upper half of iris pale green, lower half golden-yellow with black lines (J. Vicente Rueda field notes, 11 Nov., 1993).

Measurements of holotype in millimeters. SVL 26.5, tibia 15.1, HW 10.1, head length 10.8, chord of head length 11.9, upper eyelid width 2.4, IOD 3.0, tympanum length 1.5, eye length 3.1, E-N 4.0.

Natural history. Only three specimens of this striking species have been found. Two are adult females and the third is a juvenile male, 11.6 mm SVL. The holotype was found sitting on a leaf about 50 cm above the ground in secondary forest.

Remarks. *Eleutherodactylus tribulosus* is of interest in part because it is such a striking frog (green, bearing many conical tubercles) but primarily because it appears to be the sister species of *E. galidi* (Jimenez de la Espada) known from the Amazonian slopes of the Andes in Ecua-

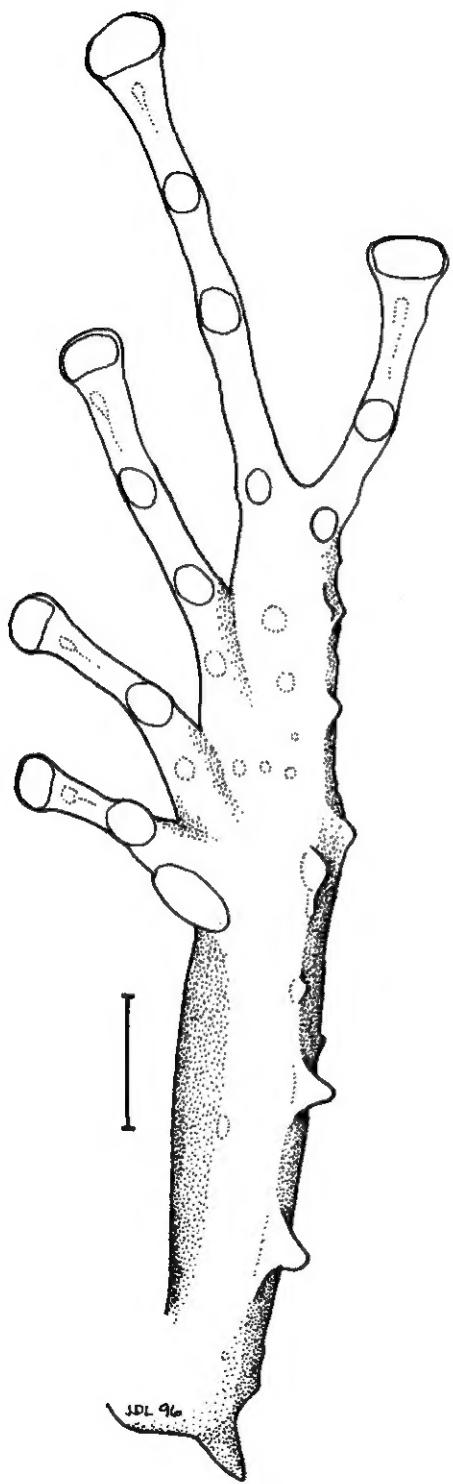


Figure 5. Foot of *Eleutherodactylus tribulosus* sp. nov. (ICNMHN 37169). Scale equals 2 mm.

dor (Lynch, 1996b). The crania are readily separated because the bony tubercle posteromedial to the eye in *E. tribulosus* (Fig. 6) is not incorporated into a cranial crest as it is in *E. galdi* (Lynch, 1971:147). The free-standing bony tubercle of *E. tribulosus* appears to be the homologue of the posterior end of the cranial crest in *E. galdi*. In *E. tribulosus* the cranial crests are otherwise difficult to detect externally (in contrast to *E. galdi*) and are oriented dorsolaterally rather than vertically. Additionally, in *E. tribulosus* the tubercles on the squamosal are very low (unlike in other species of the *galdi* group) and the zygomatic ramus is markedly deeper than in the other three species (Fig. 6). *Eleutherodactylus tribulosus* has the

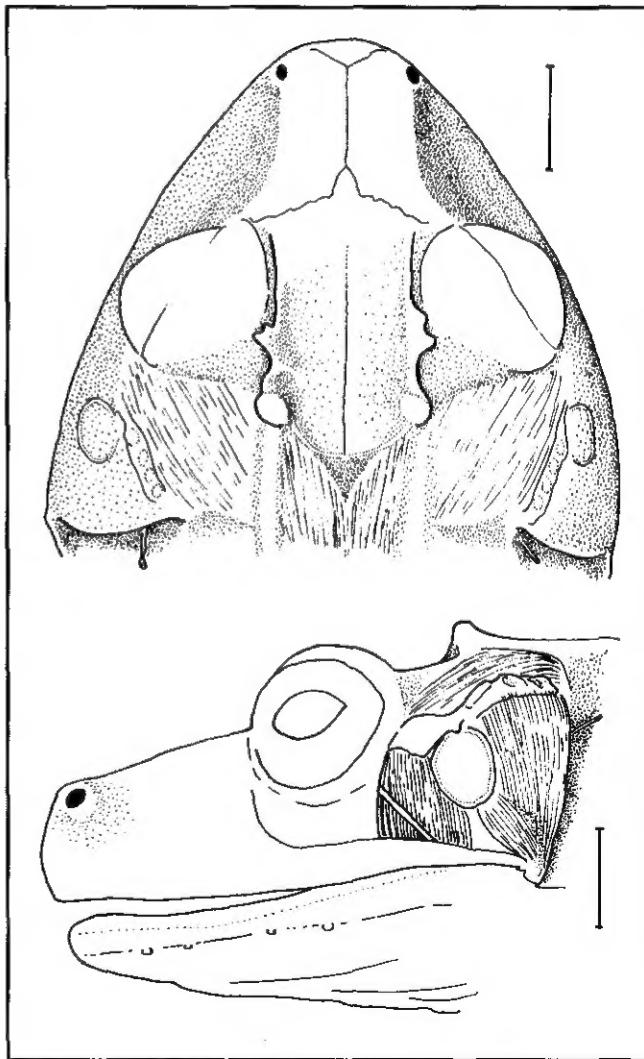


Figure 6. Skinned head of *Eleutherodactylus tribulosus* sp. nov. (ICNMHN 36559) showing arrangements of skull bones and jaw musculature. Scales equal 2 mm.

plesiomorphic condition of the sacrum (articulating with the next anterior vertebra). The relationships of the four species of the *E. galidi* group, as presently understood, are [(*galidi tribulosus*)(*delicatus douglasi*)]. The impressive geographic disjunctions noted by Lynch (1996b) remain impressive but one might expect to find either *E. galidi* and/or *E. tribulosus* distributed along the eastern flanks of the Cordillera Central in departamentos Huila and Tolima if forest remnants persist in those areas. With the discovery of *E. tribulosus* on the Cordillera Central, there appears to be little likelihood that *E. galidi* will be found along the Cordillera Oriental. We have recently verified the presence of *E. douglasi* on the Serranía de los Motilones (municipio La Jagua de Ibirico, Departamento de César), narrowing the distributional gap between that species and *E. delicatus*.

Eleutherodactylus veletis sp. nov.

Fig. 7

Holotype. ICNMHN 37206, an adult female, one of a series collected 6 November 1994 by Humberto Piñeros, Fabio Quevedo, and J. Vicente Rueda.

Type-locality. COLOMBIA, Departamento de Caldas, Municipio de Pensilvania, Km 24 carretera Pensilvania a Arboleda, por una troche que conduce a Florencia, Caldas, sitio «Puerto Suarez», 2000-2150 m.s.n.m.

Paratypes. ICNMHN 37212-18, topotypes taken with holotype; ICNMHN 36538-40, Municipio de Pensilvania, Km 18 (carr. Pensilvania a Arboleda) hacia la Arboleda, 2000-2450 m.s.n.m.; ICNMHN 37207-08, Municipio de Samana, corregimiento de Florencia, ca 6-10 km SW Florencia, ICNMHN 37209, sitio El Estadero, 1850 m.s.n.m., ICNMHN 37210-11, sitio El Estadero, 1950 m.s.n.m.

Referred specimens. ICNMHN 37220 (taken with holotype); ICNMHN 37219, 37221 (Caldas, Samana, correg. Florencia, zona del Rancho Quemado y El Estadero).

Etymology. Latin, a skirmisher; the name is used in allusion to the color pattern which reminded the collectors of the camouflage clothing preferred by the guerillas who are also endemic to these forested regions. Furthermore, the chin pattern (Fig. 7) resembles loosely the chevrons seen on the sleeves of some military persons.

Diagnosis. (1) skin of dorsum smooth, lacking dorsolateral folds, that of venter areolate; (2) tympanum round, 1/3 to 2/5 eye length; (3) snout long, subacuminate in dorsal view, rounded in lateral profile; canthus rostralis prominent; (4) upper eyelid relatively narrow, bearing conical tubercle; no cranial crests; (5) vomerine odonto-

phores prominent, oval to subtriangular in outline; (6) males with nuptial pads, lacking vocal slits; (7) first finger shorter than second, outer fingers bearing round discs; (7) fingers long, slender, bearing narrow lateral keels; (9) no ulnar tubercles except antebrachial; (10) minute tubercles on heel, outer edge of tarsus and inner edge of tarsus; (11) two metatarsal tubercles, inner oval, 6-8 X size of outer; (12) toes long and slender, bearing lateral keels but no webbing; fifth toe longer than third but not reaching distal subarticular tubercle of Toe IV; (13) Dosrum gray with dark brown markings edged with cream; venter cream with brown reticulum; throat bears brown chevrons outlined in white; posterior surfaces of thighs brown with cream spots; (14) adults moderate-sized, males 25.9-27.8 ($\bar{x} = 26.8 + 0.3$) mm SVL, females 31.5-36.6 ($\bar{x} = 33.4 + 0.5$) mm SVL.

Eleutherodactylus veletis is most similar to *E. cabrerai*, with which it was confused in the field. However, the dorsum of *E. cabrerai* is warty (not smooth), *E. cabrerai* has a deep snout when viewed laterally (shallow in *E. veletis*), and the tympanic annulus is concealed beneath the skin of the side of the head (tympanum present in *E. veletis*). In spite of their superficial similarity, we do not think *E. cabrerai* closely related to *E. veletis*.

Description. Head as wide as body, longer than wide; HW 37.1-40.0 ($\bar{x} = 38.6 + 0.4$)%SVL in males, 36.9-40.3 ($\bar{x} = 38.3 + 0.4$)% in females; snout subacuminate in dorsal view, rounded in lateral profile; snout long, E-N 84.6-105.7 ($\bar{x} = 94.3 + 2.8$)% eye length in males, 95.8-107.3 ($\bar{x} = 104.4 + 1.0$)% in females; nostrils protuberant, directed dorsolaterally; canthus rostralis straight to weakly concave; loreal region weakly concave, sloping abruptly to lips; upper eyelid bearing small conical tubercle (Fig. 7), relatively narrow, eyelid width 93.1-119.2 ($\bar{x} = 105.0 + 4.1$)% IOD in males, 71.0-100.0 ($\bar{x} = 87.0 + 3.1$)% in females; no cranial crests; supratympanic fold indistinct except behind tympanum (evident as keel), ending well above insertion of arm; tympanum prominent, round, its length 33.3-40.0 ($\bar{x} = 35.1 + 1.0$)% eye length in males, 32.5-42.9 ($\bar{x} = 36.1 + 1.2$)% in females, separated from eye by distance equal tympanum diameter; 1-2 conical postrostral tubercles; choanae round to subtriangular in outline, not concealed by maxillary shelf when roof of mouth is viewed from directly above; vomerine odontophores median and posterior to choanae, each almost size of a choana in females (smaller than in males), separated by distance equal 1/2 dentophore width, each bearing 2-3 teeth in males, 3-4 teeth in females, in a slanted row; tongue longer than wide, posterior edge notched, posterior 1/4 not adherent to floor of mouth; males lack vocal slits.

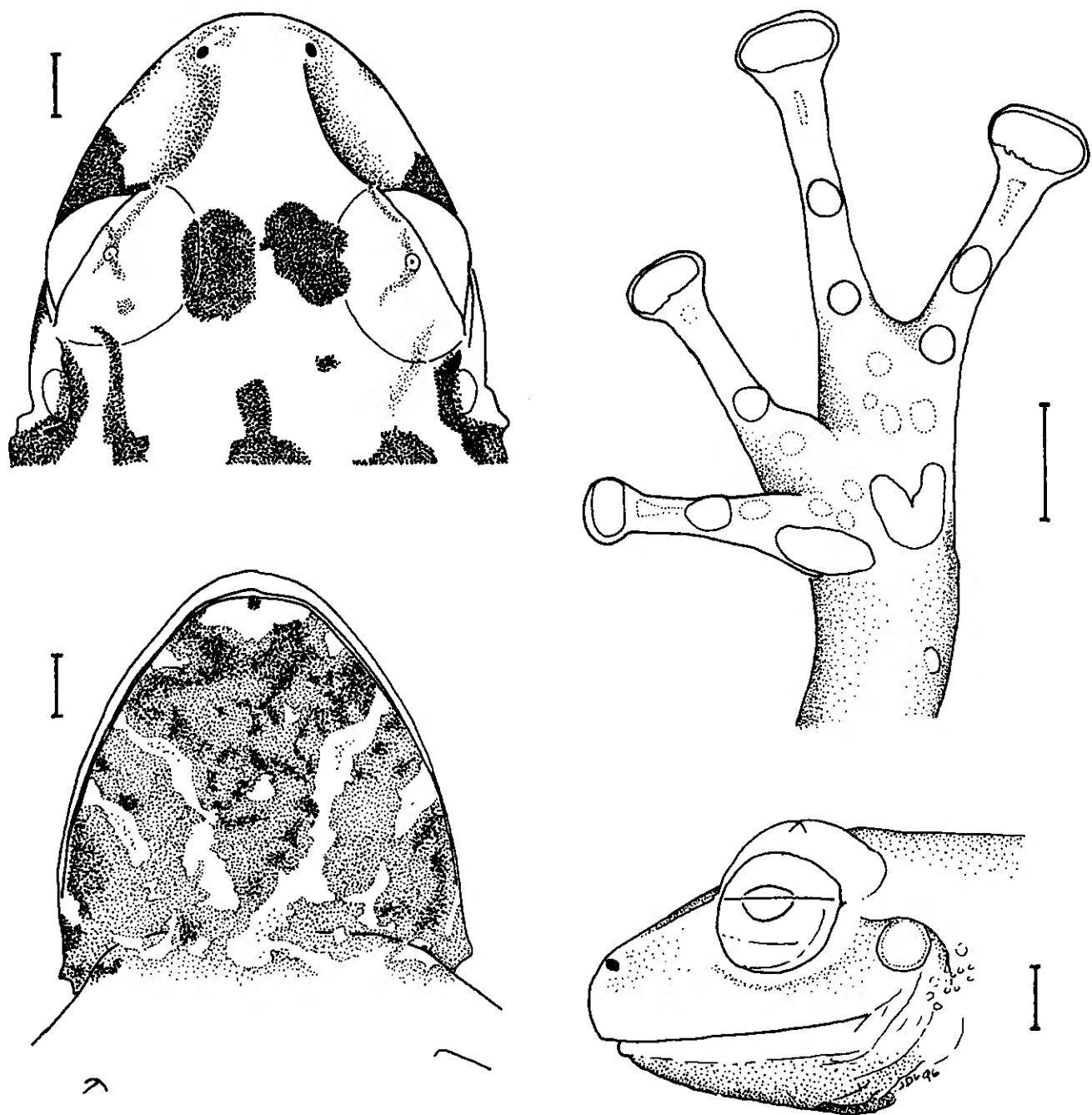


Figure 7. *Eleutherodactylus veleis* sp. nov. Top of head (ICNMHN 37206) and throat (ICNMHN 37208) showing color patterns, hand (ICNMHN 37208) and side of head (ICNMHN 37210). Scales equal 2 mm.

Skin of head smooth; that of body smooth except for scattered subconical tubercles; skin of venter coarsely areolate; discoidal folds well anteriad to groin; no anal sheath or perianal tubercles; skin of limbs smooth; area behind tympanum and on lower flanks coarsely areolate; small antebrachial tubercle; palmar tubercle bifid, twice size of oval thenar tubercle; numerous supernumerary palmar tubercles; subarticular tubercles more elevated, nonconical, round to slightly longer than wide; lateral keels on long slender digits; digital pads round; first finger shorter than second; nuptial pad on top of thumb of males.

Minute conical tubercle on heel; two small tubercles along outer edge of tarsus; small tubercle just proximal to inner metatarsal tubercle; inner metatarsal tubercle 2 1/2 times as long as wide, outer low, 1/6 - 1/8 size of inner; supernumerary plantar tubercles at bases of toes except below IV-V, in row of up to three tubercles; lateral keels on toes but no webbing; toe III reaches to middle of penultimate subarticular tubercle of toe IV, tip of toe V reaches about 1/2 way between penultimate and distal subarticular tubercles of toe IV; toe discs expanded, smaller than those of outer fingers; heels overlapping slightly to substantially when flexed hindlegs held perpendicular to sagittal plane; shank 52.2-59.1 ($\bar{x} = 55.6 + 1.0\%$) SVL in males, 50.5-57.3 ($\bar{x} = 54.3 + 0.9\%$) in females.

Dorsum gray with bold dark brown markings edged with cream; interspaces gray with brown to black flecking; limbs boldly barred; bars as wide as interspaces, more or less transverse on shank; posterior surfaces of thighs brown with continuation of pale interspaces as series of cream flecks; flanks and anterior surfaces of thighs brown, groin same but bearing many small cream spots; underside of shank brown with cream bars; venter heavily reticulated with brown over cream; throat brown with darker figures outlined with white (Fig. 7).

In life, pale brown above with dark brown markings; venter brown with fine cream mottling; gular markings dark brown (Pedro M. Ruiz field notes of specimens transported live to Bogota). Other individuals were described as having olive-brown to reddish-gold irises; dorsum pale brown to yellowish ochre with nearly black markings; venters pale gray or black with sepia or black reticula (J. Vicente Rueda field notes, 8-12 Nov. 1993).

Measurements of holotype in millimeters. SVL 36.6, tibia 18.5, HW 13.5, head length 14.5, chord of head length 15.4, upper eyelid width 3.4, IOD 3.4, tympanum length 1.6, eye length 4.5, E-N 4.8.

Natural history. *Eleutherodactylus veletis* was confused in the field with *E. cabrerai* because their dorsal patterns closely resemble one another and because each was temporarily identified in the field by a field name, «camuflado», reflecting that color pattern. Subsequent sorting of specimens and notes suggests that *E. veletis* is a species found on vegetation and branches up to 1.5 meters above the forest floor, especially along streams.

Discussion

These three species are merely the first of the new species to be described from this fauna and two of them (*E. lichenoides* and *E. tribulosus*) add to the emerging biogeographic patterns among the frogs of the genus *Eleutherodactylus* found in cloud forests. The discovery of *E. lichenoides* in eastern Caldas adds to the known biogeographic connection between the two western cordilleras of Colombia, albeit in this case with different species on the two cordilleras (in contrast to the distributions of such species as *E. babax*, *E. erythropleura*, *E. mantipus*, and *E. thectopternus* where the distributions are disjunct upon the two cordilleras, separated by inhospitable environments of the valley of the río Cauca). *Eleutherodactylus tribulosus* belongs to a distinct pattern of distribution, linking the northern Cordillera Central with the eastern flanks of the Ecuadorian Andes.

This diverse fauna extends the rich eleutherodactyline fauna cited by Ruiz-C. et al. (1996) for the northern Cordillera Occidental into at least part of the Cordillera Central although the fauna of Florencia, Caldas, appears to be even larger than those cited by Ruiz-C. et al. (1996). Some of the species found in the Florencia, Caldas, fauna were known previously only from highland areas north of Medellín and near Sonsón. Those areas have not been as extensively sampled as has the Florencia, Caldas, region and one must anticipate that this diverse fauna will prove to be characteristic of the remaining fragments of cloud forests of the northern Cordillera Central.

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